

ZXTR2012P5

**100V INPUT, 12V 40mA REGULATOR TRANSISTOR
POWERDI®5**

Description

The ZXTR2012P5 monolithically integrates a transistor, Zener diode and resistor to function as a high voltage linear regulator. The device regulates with a 12V nominal output at 15mA. It is designed for use in high voltage applications where standard linear regulators cannot be used. This function is fully integrated into a PowerDI-5 package, minimizing PCB area and reducing number of components when compared with a multi-chip discrete solution.

Features

- Series Linear Regulator Using Emitter-Follower Stage
- Input Voltage = 15V to 100V
- Output Voltage = 12V ± 10%
- Fully integrated into a PowerDI-5 package
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

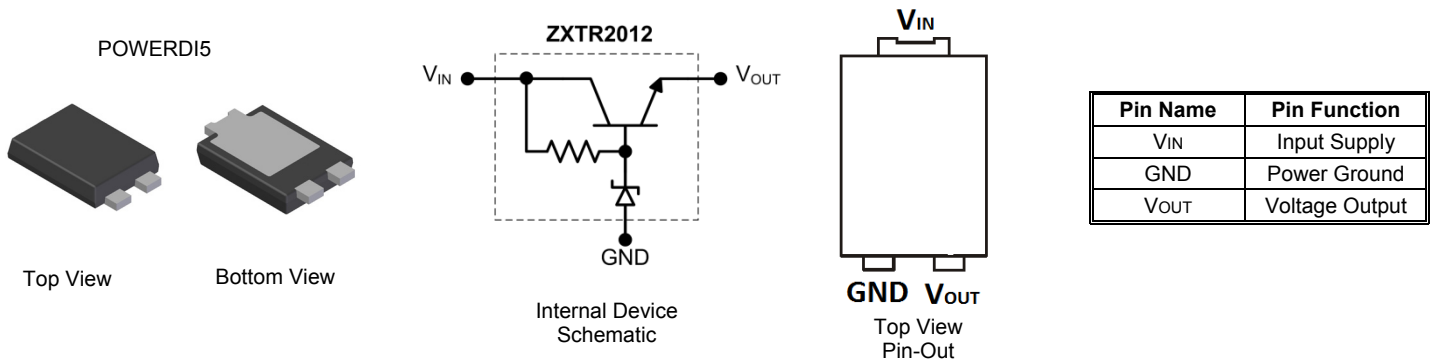
Applications

Supply voltage regulation in:

- Networking
- Telecom
- Power Over Ethernet (PoE)

Mechanical Data

- Case: PowerDI-5
- Case Material: Molded Plastic. "Green" Molding Compound.
- UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208
- Weight: 0.100 grams (approximate)



Ordering Information (Note 4)

Product	Package	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXTR2012P5-13	PowerDI-5	ZXTR2012	13	16	5,000

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen and Antimony free, "Green" and Lead-Free.
 3. Halogen and Antimony free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 4. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>

Marking Information



ZXTR2012 = Product Type Marking Code
 = Manufacturers' Code Marking
 K = Factory Designator
 YYWW = Date Code Marking
 YY = Last Two Digits of Year (ex: 13 for 2013)
 WW = Week code (01 to 53)

Absolute Maximum Ratings (Voltage relative to GND, @T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Input Supply Voltage	V _{IN}	-0.3 to 100	V
Continuous Input & Output Current	I _{IN} , I _{OUT}	550	mA
Peak Pulsed Input & Output Current	I _{IM} , I _{OM}	2	A
Maximum Voltage applied to V _{OUT}	V _{OUT(max)}	18	V

Maximum Current at V_{IN} = 48V (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Continuous Output Current (Note 7)	I _{OUT}	50	mA
Pulsed Output Current (Note 8)	I _{OM}	880	mA
		180 (Note 9)	

Thermal Characteristics

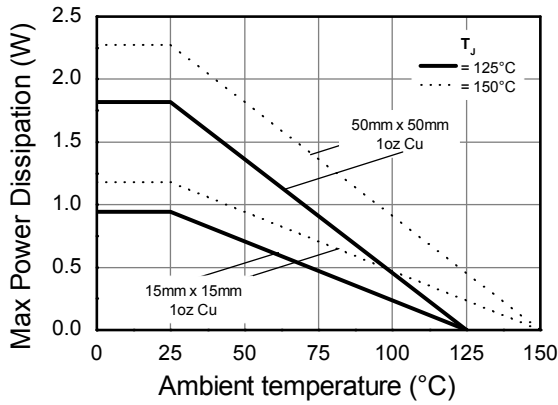
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P _D	1.82	W
		0.94 (Note 6)	
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	55	°C/W
		107 (Note 6)	
Thermal Resistance, Junction to Lead (Note 10)	R _{θJL}	20	
Thermal Resistance, Junction to Case (Note 10)	R _{θJC}	17.8	
Recommended Operating Junction Temperature Range	T _J	-40 to +125	°C
Maximum Operating Junction and Storage Temperature Range	T _J , T _{STG}	-65 to +150	

ESD Ratings (Note 11)

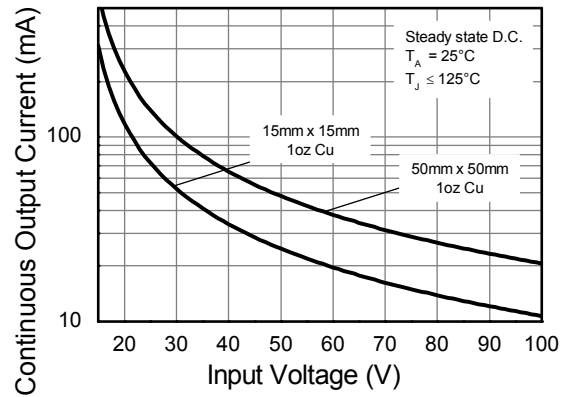
Characteristics	Symbols	Value	Unit	JEDEC Class
Electrostatic Discharge – Human Body Model	ESD HBM	4000	V	3A
Electrostatic Discharge – Machine Model	ESD MM	400	V	C

- Notes:
- For a device mounted with the exposed V_{IN} pad on 50mm x 50mm 1oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in steady-state.
 - Same as note 5, except mounted on 15mm x 15mm 1oz copper.
 - Same as note 5, whilst operating at V_{IN} = 48V. Refer to Safe Operating Area for other Input Voltages.
 - Same as note 5, except measured with a single pulse width = 100µs and V_{IN} = 48V.
 - Same as note 5, except measured with a single pulse width = 10ms and V_{IN} = 48V.
 - R_{θJL} = Thermal resistance from junction to solder-point (on the exposed V_{IN} pad).
 - R_{θJC} = Thermal resistance from junction to the top of case.
 - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

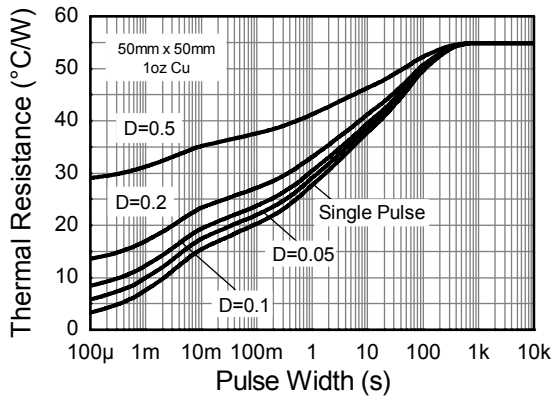
Thermal Characteristics and Derating Information



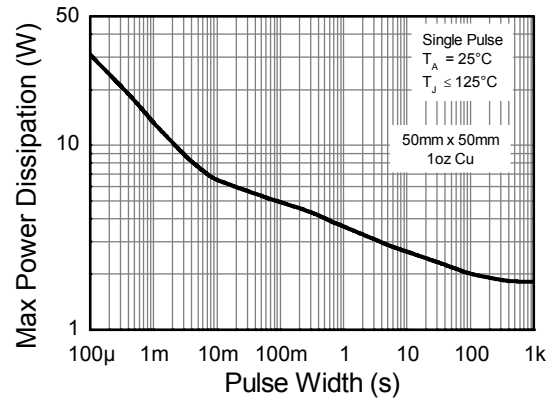
Derating Curve



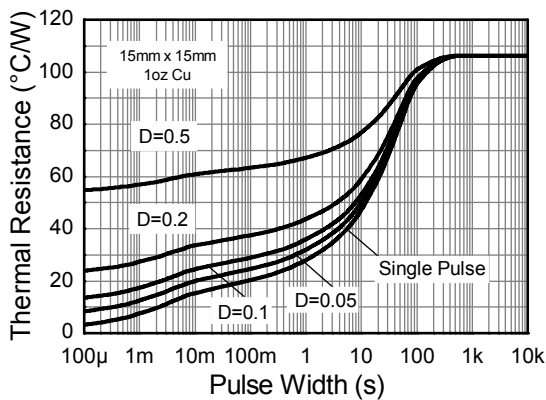
Safe Operating Area



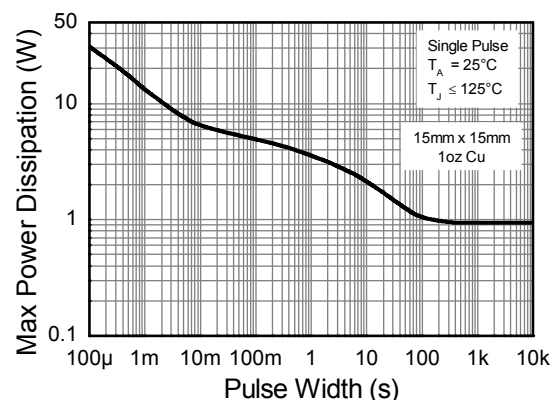
Transient Thermal Impedance



Pulse Power Dissipation



Transient Thermal Impedance



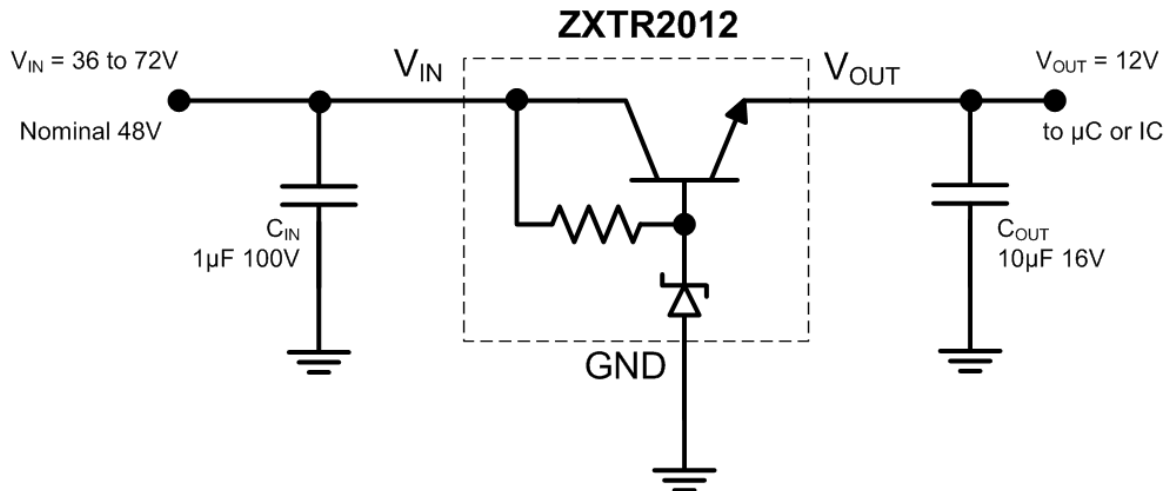
Pulse Power Dissipation

Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Output Voltage (Note 12)	V_{OUT}	10.8	12	13.2	V	$V_{IN} = 48\text{V}$, $I_{OUT} = 15\text{mA}$
Line Regulation (Notes 12 & 13)	ΔV_{OUT}	—	240	750	mV	$V_{IN} = 15$ to 72V , $I_{OUT} = 15\text{mA}$
Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	—	8.0	—	mV/ $^\circ\text{C}$	$T_J = -40^\circ\text{C}$ to $+125^\circ\text{C}$ $V_{IN} = 48\text{V}$, $I_{OUT} = 15\text{mA}$
Load Regulation (Notes 12 & 14)	ΔV_{OUT}	—	-450 -600	-600 -750	mV	$I_{OUT} = 0.1$ to 30mA , $V_{IN} = 48\text{V}$ $I_{OUT} = 0.1$ to 100mA , $V_{IN} = 48\text{V}$
Minimum Value of Input Voltage Required to Maintain Line Regulation	$V_{IN(MIN)}$	15	—	—	V	—
Quiescent Current	I_Q	—	240 590	400 900	μA	$V_{IN} = 48\text{V}$, $I_{OUT} = 10\mu\text{A}$ $V_{IN} = 100\text{V}$, $I_{OUT} = 10\mu\text{A}$
Power Supply Rejection Ratio	$\Delta V_{IN}/\Delta V_{OUT}$	—	45	—	dB	$C_{OUT} = 100\text{nF}$, $I_{OUT} = 15\text{mA}$, $V_{OUT} = 12\text{V}$, $V_{IN} = 15$ to 100V , $f = 100\text{Hz}$

- Notes:
- 12. Measured under pulsed conditions. Pulse width $\leq 300\mu\text{s}$. Duty cycle $\leq 2\%$.
 - 13. Line regulation $\Delta V_{OUT} = V_{OUT}(@ V_{IN} = 72\text{V}) - V_{OUT}(@ V_{IN} = 15\text{V})$
 - 14. Load regulation $\Delta V_{OUT} = V_{OUT}(@ I_{OUT} = 30\text{mA}) - V_{OUT}(@ I_{OUT} = 0.1\text{mA})$
 $\Delta V_{OUT} = V_{OUT}(@ I_{OUT} = 100\text{mA}) - V_{OUT}(@ I_{OUT} = 0.1\text{mA})$

Typical Application Circuit

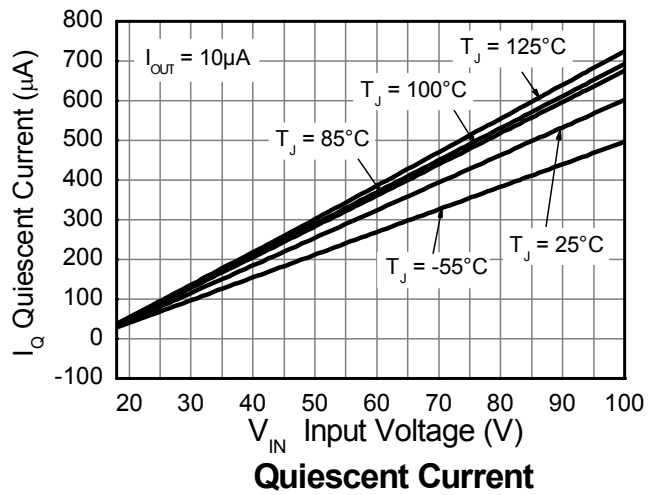
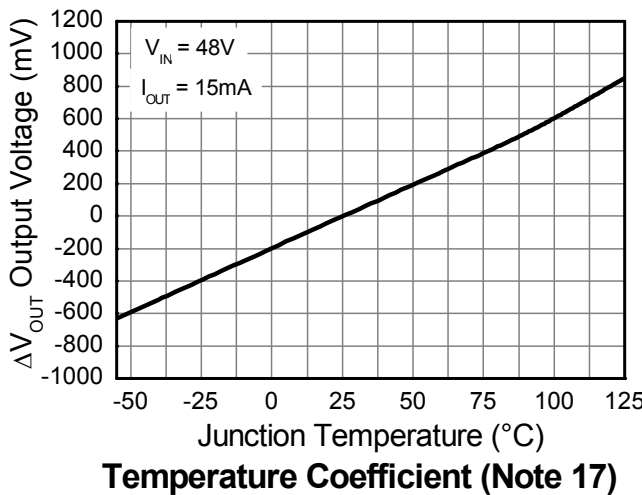
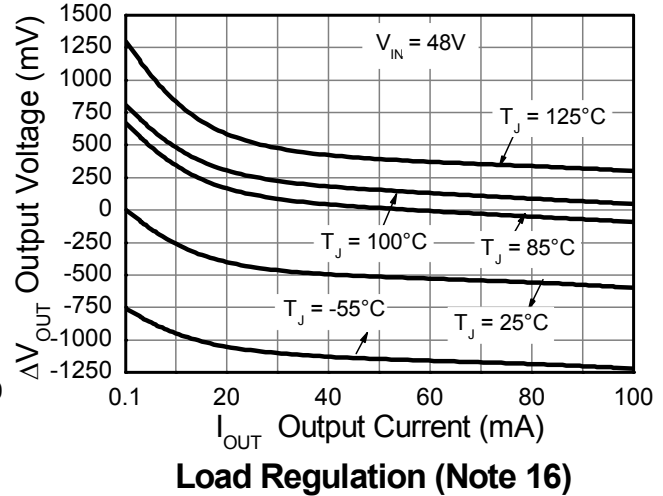
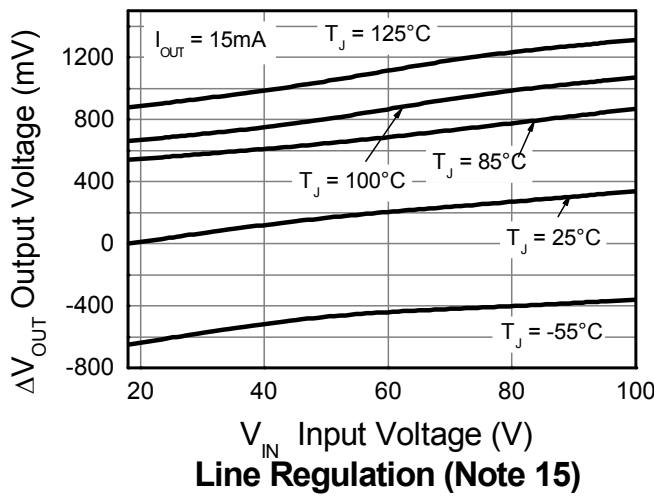
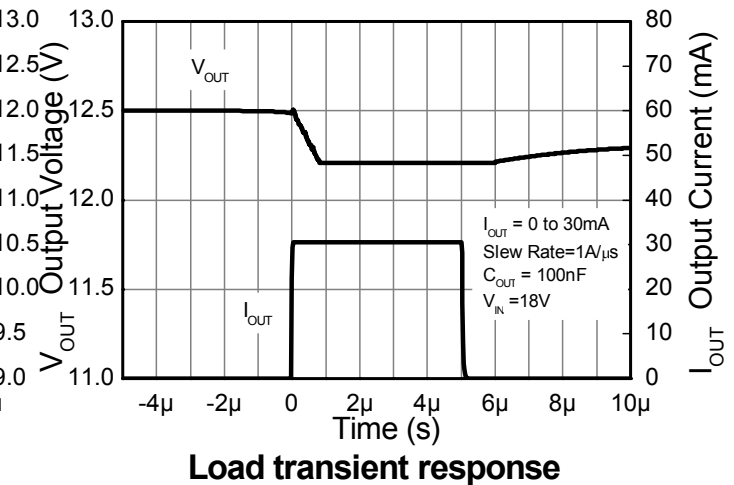
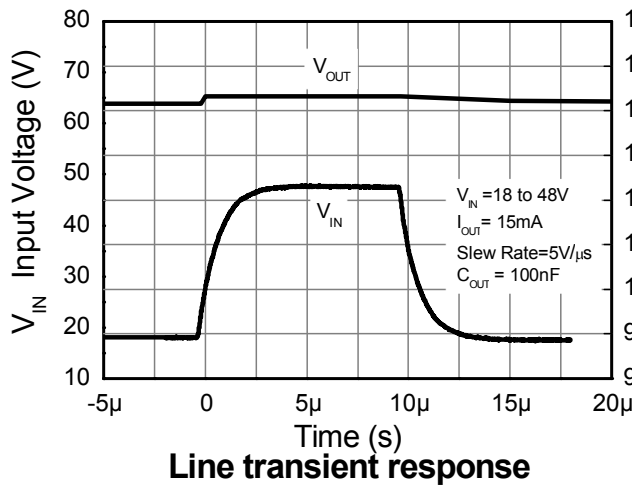


Example of an 12V regulated supply from a nominal 48V for powering a Controller IC.

Pin Functions

Pin Name	Pin Function	Notes
V_{IN}	Input Supply	To maintain output regulation the input voltage can vary from 15V to 100V with respect to the GND pin. It is recommended to connect a 1 μF capacitor to GND.
GND	Power Ground	This pin should be tied to the system ground.
V_{OUT}	Voltage Output	Outputs a regulated 12V. It is recommended to connect a 10 μF capacitor to GND. Minimum of 10 μA must be drawn from V_{OUT} to maintain regulation. The pin can be pulled high to a maximum of 18V with respect to ground.

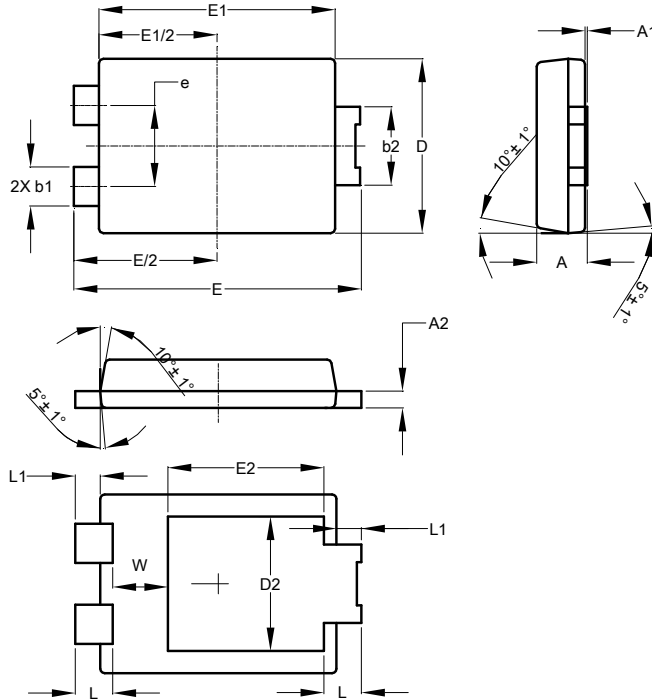
Typical Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)



Notes: 15. Line regulation $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 15\text{V}, I_{OUT} = 15\text{mA}, T_J = +25^\circ\text{C})$
 16. Load regulation $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 48\text{V}, I_{OUT} = 0.1\text{mA}, T_J = +25^\circ\text{C})$
 17. Temperature Coefficient $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 48\text{V}, I_{OUT} = 15\text{mA}, T_J = +25^\circ\text{C})$

Package Outline Dimensions

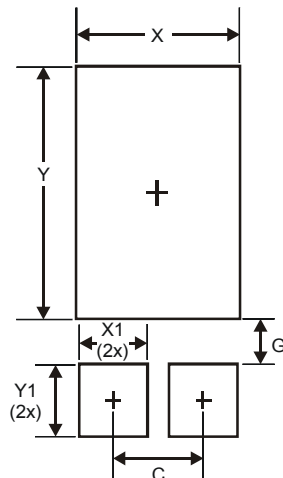
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



POWERDI [®] 5			
Dim	Min	Max	Typ
A	1.05	1.15	1.10
A2	0.33	0.43	0.381
b1	0.80	0.99	0.89
b2	1.70	1.88	1.78
D	3.90	4.05	3.966
D2	-	-	3.054
E	6.40	6.60	6.504
e	-	-	1.84
E1	5.30	5.45	5.37
E2	-	-	3.549
L	0.75	0.95	0.85
L1	0.50	0.65	0.57
W	1.10	1.41	1.255
All Dimensions in mm			

Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



Dimensions	Value (in mm)
C	1.840
G	0.852
X	3.360
X1	1.390
Y	4.860
Y1	1.400

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